CAAP Quarterly Report

Date of Report: *December 30, 2014*

Contract Number: DTPH5614HCAP06

Prepared for: Department of Transportation

Project Title:
Robust Anomaly Matching for ICIPs: Reducing Pipeline Assessment Uncertainty Through 4-Dimension Anomaly Detection and Characterization

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For quarterly period ending: December 31, 2014

Business and Activity Section

1. **Generated Commitments -**
   - 1.1. *Agreement Changes*
     - 1.1.1. *No changes to agreement*
   - 1.2. *Purchases*
     - 1.2.1. *Tubing for surrogate-pipe test fixture --- $45.20*

2. **Status Update of Past Quarter Activities -**
   - 2.1. **Kickoff Meeting:** Held at CSM, October 6, 2014. Jim Merritt and David Mulligan from DOT and John Steele and Craig Champlin from CSM were in attendance. A presentation on the research to be conducted was given, and the DOT managers gave us advice on how to be most effective in producing useful results.
   - 2.2. **Experimental Setup:** Initial work on the CSM Experimental Lab Test Setup for surrogate pipe integrity sensor data has been underway. Initial data collection has been completed, but the data is not of sufficient quality to be used for generating data sets for algorithm testing.
   - 2.3. **SAM:** Initial investigation of steps needed to adapt robotic algorithms to Pipe Integrity Mapping
   - 2.4. **Additional Activitiy:** Initial contact with PRCI concerning poster presentation and possible oral presentation at the PRCI Winter Measurement Technical Committee Meeting in Houston in February.

3. **Description of any Problems/Challenges –**
   - 3.1. Due to limitations in our initial test setup, good quality data to be used for algorithm testing has not be generated. Basically the problem is that the mobile track we are using is moving too fast and as a result the scan resolution in the axial direction is not dense enough to produce useable data. We are working on a new drive system for the sensor cart and expect to have data in January.
   - 3.2. We have identified that girth welds will be very important to our registration process. We intend to do some experimentation in Quarter 1 - 1015 (Jan-Mar 2015) to develop data that will test our ability to reliably detect and use the girth weld signature.

3.3. Access to real pipe integrity data will be critical to our success since work with the surrogate sensor and test rig will be of only limited use in demonstrating the value of our analytics. We also recognize that we will need multiple runs of data to test the algorithm. During Quarter 1 2015, we will aggressive pursue opportunities to get real data from industrial sources.

3.4.

<Please describe if any problems were experienced during this reporting period and what actions may be needed to overcome the problem.>

4. **Planned Activities for the Next Quarter** –

4.1. The following activities are planned for Quarter 1 2015

4.1.1. Test preliminary algorithm on synthetic data

4.1.2. Identify additional SAM candidate algorithms

4.1.3. Implement additional SAM algorithmic approaches

4.2. Based on progress from last quarter, these objectives remain largely intact.

4.2.1. 1) Modify test rig:

4.2.1.1. Increase linear scan density

4.2.1.2. Lengthen test rig to accommodate 3 contiguous sections of "pipe"

4.2.2. Test SAM algorithm

4.2.2.1. Test against sparse visual data

4.2.2.2. Adapt for virtual frames and test

4.2.2.3. Test against multiple "pipe" segments with sparse anomalies

4.2.3. Implement Kalman filter with virtual frames and odometry